REQUIRED COVER PAGE

APPLICATION FOR FACULTY RESEARCH GRANT

**All questions must be completed to be considered for grant award.

Choose one: [ ] Creative P [x] Research	**Date of Last FRG Award** (Semester and Year awarded): _____ **Date of ATU Faculty Appointment** (Semester and Year): __Fall 1998_____

1. Project Title: __Effects of Speed on Overarm Throwing: A Dynamic Systems Perspective_____

2. Name of Principal Investigator/Project Director:___Shelia L. Jackson, Ph.D._____

3. School (abbrev): Education____ 4. Department: _Health and Physical Education_____

5. Campus Mail Address: _____Hull 118_____ 6. PI/PD Campus Phone: __498-6095____

7. Amount Requested: $_1,816_____ 8. Total Cost of Project: $__13,866.80_____

9. Does this project involve: **10. Duration of Project: ___7/1/05-5/1/06_____**

Yes	No	
[x]	[ ]	human subjects?
[ ]	[ ]	animals/animal care facility?
[ ]	[ ]	radioactive materials?
[ ]	[ ]	hazardous materials?
[ ]	[ ]	biological agents or toxins restricted by the USA Patriot Act?
[ ]	[ ]	copyright or patent potential?
[ ]	[ ]	utilization of space **not** currently available to the PI/PD?
[ ]	[ ]	the purchase of equipment/instrumentation/software currently **available** to the PI/PD?

NOTE: If the answer is "yes" to any of the above questions, the investigator must attach appropriate documentation of approval or justification for use/purchase.

SIGNATURES

Department Contribution (if applicable): $ 10,550.80_

Account Number: _211120_____

Annette Holeyfield 10/5/2005
Chairperson **Date**

School Contribution (if applicable): $_818.55___

Account Number: _____2-13912_____

10-5-05
Dean **Date**

This Section to be completed by the Office of Academic Affairs

FSBA Committee Award Recommendation: Yes____ No____
FSBA Committee Proposal Rank: _____ of _____ Total Proposals.
Recommendation of VPAA: Yes____ No _____
Recommendation of President: Yes____ No _____
Award Date: _____

B. ABSTRACT: The dynamic systems theory stresses the interrelationship between the environment and the individual (Haywood, 1993). If manipulating the speed of the throw causes the performer to alter his/her pattern to a less mature pattern or an altogether new pattern (e.g., an underhand toss), the change, from a dynamic systems perspective, would be controlled by speed and not a motor program. Coordinative structures are also an important aspect of the dynamic systems theory. These exist when specific collectives of muscles and joints develop functional synergies, through practice or naturally, and act cooperatively to produce an action (Magill, 2004). If elite performers maintain the throwing pattern better than the novice throwers, then from a dynamic systems perspective, it would be because they have developed a stronger coordinative structure through practice. The purpose of this study was to determine the effects of altering the speed of the overarm throw on elite and novice throwing patterns and relating the results to the dynamic systems theory. Volunteers from the varsity baseball and softball teams of a NCAA Division II university participated as the elite throwing subjects (N = 36). Subjects performed five trials throwing at full speed while being monitored by a radar gun. Then subjects threw half speed and one-quarter speed of their fastest throw. Participants received feedback from the test administrator as to whether they needed to alter the speed of their throw. The same procedure was followed for the novice throwers (fourth-graders; N = 36). The videotaped data were analyzed using Mosher's Test for Overarm Throwing (1983) by two trained researchers. A two-way ANOVA and Scheffe multiple comparison tests were conducted and significant differences ($p < 0.05$) were found among the groups and the treatments. It was concluded that the two major concepts of the dynamic systems theory were supported.

C. PURPOSE: The purpose of this study was to determine the effects of altering the speed of the overarm throw on elite and novice throwing patterns and relating the results to the dynamic systems theory. The hypotheses are as follows:

There are no significant differences ($p > 0.05$) between elite and novice movement patterns, between male and female movement patterns, or in the interaction between speed and movement patterns on the overhand throw.

D. SIGNIFICANCE/NEED:

What makes an extremely complex motor skill such as a tennis serve look so easy when performed by a professional athlete but almost laughable when performed by a novice? Are there motor programs stored in the brain for all the various skilled tasks which direct all the limbs to move at precise times and directions? Is there a different program for every situation? Researchers who adhere to the dynamical systems (Thelen, Kelso, & Fogel, 1987), self-organizing (Kugler, 1986), or synergetic theory (Kelso & Schoner, 1991) would argue against the cerebral functional distance model (Kinsbourne & Hicks, 1978) or the generalized motor programs concept (Schmidt, 1975) which place the brain at the center of all coordinated movement. Instead, such researchers argue for the presence of specific innate patterns of interlimb organization which are programmed below the cortex (Grillner, 1975) and that movement patterns are not the result of complicated motor programs but largely a result of the action of a physical body in a gravitational world (Whitall, 1990). In the field of physical education, it becomes very important to study and test these theories in order to develop better methods of teaching complex movements and skills. For example, in working with a child who is not using his/her arms appropriately while running, a person adhering to the motor program perspective might tell the child to "pump your arms" when running whereas someone from a

dynamical systems perspective might encourage the child to run faster. The first is trying to get the child to "think" about his/her pattern, the second is trying to use the "condition" (in this case speed) to bring the appropriate pattern "out."

E. PROCESS FOR ATTAINMENT OF OBJECTIVES:

TIMELINE FOR COMPLETION OF RESEARCH

Tasks to be completed by the following dates:	Kinematic comparative analysis of elite and novice male and female overhand throwers: A dynamic systems perspective
7/1/05	Complete pilot study, methods, and procedures
8/1/05	Film elite and novice performers
9/1/05	Analyze data & submit for presentation
10/1/05	Review of literature
11/1/05	Write paper
12/1/05	Submit for publication
1/1/06	Prepare presentation
5/1/06	Present at National AAHPERD & submit Final Report

Methods

Volunteers from the varsity baseball and softball teams of Arkansas Tech University participated as the elite throwing subjects. After a five-minute throwing warm-up, subjects were videotaped (saggital plane) throwing a ball of their respective sports at a target (1.5m x 0.9m and from a distance of 5.2m) for five trials at their preferred speed and monitored with a speed gun. They then performed five trials at full speed. After completing their trials at full speed, subjects either threw half speed and then one-quarter speed or vice versa (random assignment). The speed of the fastest throw determined the appropriate half and one-quarter speeds. Subjects continued to throw until the speeds targeted (half or one-quarter) were within one mph and received feedback from the administrator as to whether they needed to speed up or slow down their throw.

The same procedure was followed for the novice throwers (thirty-six fourth-grade girls and boys) who had received permission from their parent(s) and/or guardian(s) to participate in the study.

The videotaped data was analyzed using Mosher's Test for Overarm Throwing (1983) validated checklist by two trained researchers (interrater reliability = 0.90). A two-way ANOVA and Scheffe multiple comparison tests were conducted and significant differences ($p < 0.05$) were found among the groups (F-Ratio = 65/62; $p = 0.0001$) and the treatments (F-Ratio = 54.04; $p = 0.0001$). Elite throwers were able to maintain form better than novice throwers, and the speed of the throw significantly affected throwing form. Thus, it was concluded that two major concepts of the dynamic systems theory were supported.

F. DISSEMINATION OF RESULTS: The results of this study have been accepted for presentation at the American Alliance for Health, Physical Education, Recreation, and Dance in Salt Lake City, Utah April 25-29th, 2006. The abstract will be published in a special preconvention supplement to Research Quarterly for Exercise and Sport. The manuscript will be submitted for publication in appropriate journals which target motor development, motor behavior, children's physical education, perceptual motor therapy, and/or biomechanics (e.g., *Research Quarterly, Strategies, Journal of Applied Biomechanics, Perceptual and Motor Skills, Arkansas Journal for Health, Physical Education, Recreation, and Dance, and the International Sports Journal).*

G. REPEATED REQUESTS:

I received a sabbatical to conduct this research project along with several others. However, monies to travel and present the results were not granted. Therefore, I have applied for and received funds from the School of Education to present the results of another study at a regional

conference in Nashville, TN and am applying to the Faculty Research Fund to travel and present the results of this research at the AAHPERD National convention in Utah.

H. BUDGET:

1.	Instructional replacement costs	3,600	
	Fringe benefits	649.80	
	Adjunct faculty	3,600	
	Fringe benefits	756	
2.	Non-work study stipend	1,545	
3.	Supplies:		
	Copying costs	100	
	Article publishing	300	

(Note: All of the above budget items were Department Contributions for my sabbatical)

4.	Travel:		
	ArkAHPERD, November 2005	500	(Department)
	SAWPASH October 2005	1,000	(School of Edu $818.55)
	National AAHPERD April 2006	**1,816**	**(FRG request)**
TOTAL PROPOSED BUDGET		13,866.80	

I. BIBLIOGRAPHY:

Grillner, S. (1975). *Locomotion in vertebrates: Central mechanisms and reflex interaction.* Physiological Review. 55, 247-304.

Haywood, K. M. (1993). *Life span motor development*. Champaign, IL: Human Kinetics.

Kelso, J., & Schoner, G. (1991). Toward a physical (synergetic) theory of biological coordination. In R. Graham (Ed.), Springer Series in Physics.

Kinsbourne, M., & Hicks, R.E. (1978). *Functional cerebral space: A model for overflow, transfer and interference effects in human performance; A tutorial review.* In J. Requin. (Ed.), Attention and Performance VII. (pp. 345-362). Hillsdale, N.J.: Erlbaum.

Kugler, P. (1986). *A morphological perspective on the origin and evolution of movement patterns.* In M.G. Wade & H.T.A. Whiting (Eds.) Motor development in children: Aspects of coordination and control (pp. 459-526). Dordrecht: Martinus Nijhoff.

Magill, R. A. (2004). *Motor learning and control: Concepts and applications* (7th ed.). Boston: McGraw Hill.

Schmidt, R. (1975). *A schema theory of discrete motor skill learning.* Psychological Review. 82. 225-260.

Thelen, E., Kelso, J., & Fogel, A. (1987). *Self-organizing systems and infant motor development.* Developmental Review, 7, 39-65.

Whitall, J. (1990). *A developmental study of interlimb coordination in running and galloping.* Ann Arbor, MI: UMI Dissertation Services.

J. APPLICATION VITA: SHELIA L. JACKSON

Associate Professor, teaching graduate biomechanics, motor behavior, and sport psychology and undergraduate elementary methods in physical education and related pedagogical courses, adapted physical education, measurement and evaluation, and first aid; Department of Health and Physical Education, Arkansas Tech University (1998 to present).

Education:

Ph.D.	Texas Woman's University, Denton	1988	Physical Education

Publications /Research Grants/Presentations

Jackson, S. (1996). Peak Performance Teaching/Research Grant for $53,760

Jackson, S. & Elders, L. M. (1996). Kinematic analysis of cycling during pregnancy. Biomechanics in sport XIII: Proceedings of the XIIIth Symposium on Biomechanics in Sports, edited by Bauer, T. International Society of Biomechanics in Sports: Thunder Bay, Ontario.

Jackson, S. & Healey, J. (2000). Interfacing computerized biomechanical analysis in monitoring the motor development of children. Perceptual and Motor Skills, 91, 999-1008.

Jackson, S. & Healey, J. (1997). Effects of a perceptual motor therapy program on three fundamental movement patterns of children: A comparative kinematic analysis. Presented at the 11th International Symposium for Adapted Physical Activity, Quebec City, Canada, May.

Jackson, S. & Holeyfield, A. (2000). Hiking for the heart. Presented at the Southern Association for Women in Physical Activity, Sport, and Health Convention in Memphis, TN.

Jackson, S. & Pederson, R. (1997). Biomechanical comparative analysis of children's badminton serves using standard and body scaled equipment: A perception-action perspective. Presented at the XVth Symposium on Biomechanics in Sports, Denton, Texas.

Jackson, S. & Tanner, E. (1993). Analysis of elite and novice disc golfers performing drives. Biomechanics in sport XI: Proceedings of the XIth Symposium of the International Society of Biomechanics in Sports, edited by Hamill, J., Derrick, T., & Elliott, E. International Society of Biomechanics in Sports: Amherst, MA.

Jackson, S. & Tanner, E. (1993). Analysis of elite and novice disc golfers performing 10 m putts. Biomechanics in sport XI: Proceedings of the XIth Symposium of the International Society of Biomechanics in Sports, edited by Hamill, J., Derrick, T., & Elliott, E. International Society of Biomechanics in Sports: Amherst, MA.

Jackson, S. & Tanner, E. (1993). Analysis of children putting and driving in disc golf. Biomechanics in sport XI: Proceedings of the XIth Symposium of the International Society of

Biomechanics in Sports, edited by Hamill, J., Derrick, T., & Elliott, E. International Society of Biomechanics in Sports: Amherst, MA.

Miller, S. A. & Jackson, S. (1996). Kinematic comparative analysis of the coordination pattern of the basketball free throw. Biomechanics in sport XIII: Proceedings of the XIIIth Symposium on Biomechanics in Sports, edited by Bauer, T. International Society of Biomechanics in Sports: Thunder Bay, Ontario, Canada.

Shelia Jackson

From: mskelley@aahperd.org
Sent: Friday, September 30, 2005 3:21 PM
To: shelia.jackson@atu.edu
Subject: Notification of Acceptance of Research Consortium Free Communication #8744

September 30, 2005

Dear Shelia L. Jackson:

Congratulations! I am pleased to inform you that abstract #8744, "Effects of Speed on Overarm Throwing: A Dynamic Systems Perspective," has been accepted as a Research Consortium 12-minute oral presentation at the 2006 AAHPERD National Convention in Salt Lake City, Utah. This format may be different from the one you preferred; however, we needed to make some changes in order to accommodate as many papers as possible on the program.

This acceptance is conditional upon our confirming that the presenting author(s) of this research are in compliance with the AAHPERD policy that limits presenters to no more than two presentations during the AAHPERD National Convention. Should we determine that one or more presenting authors on this research are on the overall program more than twice, you will be notified.

If you have coauthors on this research, it is your responsibility, as the first author, to communicate the status of the submission to them. Please forward this email to your coauthors so that they are aware that the research has been accepted for presentation.

PUBLICATION/PRESENTATION OF RESEARCH PRIOR TO APRIL 25: The research that you plan to present cannot have been presented or published elsewhere before the convention. (Submission of research for consideration by a journal is acceptable as long as the research is neither published nor presented prior to convention.) All accepted Research Consortium abstracts will be published, along with the first author's email, in a special preconvention supplement to Research Quarterly for Exercise and Sport.

PRESENTING AUTHOR(S): We will plan our program on the assumption that the author(s) marked as "presenting author" during the submission process will be presenting the free communication. If the "presenting author(s)" have changed since the submission process, please notify the Research Consortium Director, Margaret Skelley, immediately at mskelley@research.org so that we can ensure the accuracy of our program and avoid scheduling conflicts for presenters. (The author order will remain as in the submission, regardless of which author presents.)

CONVENTION DATES AND SCHEDULE: The Convention will be held from Tuesday, April 25 through Saturday, April 29, 2006. The date, time and location of your presentation have not yet been finalized. In January, you need to refer to the AAHPERD website (www.aahperd.org) for scheduling information. Although we make every effort to avoid scheduling conflicts across AAHPERD, if you have had a different proposal accepted by another component of AAHPERD, please double-check the online program, which is expected to be available around January 20, to ensure you are not double-booked.

REGISTRATION AND HOUSING: You must be a member of AAHPERD and pay the convention registration fee to attend and present your research at the convention. Online convention registration is already available on the AAHPERD website at www.aahperd.org A cost-saving "early-bird" registration rate is available until February 10 and an "advance" rate is available until March 24. Note that the "onsite" registration period begins March 25. Online housing registration is also available on the website.

PRESENTATION SPECIFICS: Please plan your presentation for 12 minutes so that there will be time for a 3-minute question period at the conclusion of each presentation in the session. Please arrive at the assigned room 10 minutes before the session and introduce yourself to the Presider so he or she can make sure the session runs smoothly.

SPEAKER READY ROOM/AV: When you arrive in Salt Lake City, please check the convention

program book to confirm the time and location of your free communication session. There will be a "speaker ready" room for your convenience. Each presentation room will have a head table with six chairs, a podium microphone, a lavaliere microphone, an LCD projector and a viewing screen. You will need to bring a laptop if you wish to use the LCD and a laser pointer if you plan to use one. Neither of these items will be available for rent in Salt Lake City.

PENALTY FOR WITHDRAWALS AND CANCELLATIONS: A penalty will be assessed for withdrawals or cancellations on or after December 1, 2005 that are deemed to be without good cause. Any cancellation before or after December 1, 2005 about which the Research Consortium Director is not notified will result in a 3-year period during which you and your coauthors will be prohibited from presenting research in any format on the Research Consortium program at AAHPERD National Conventions. Your eligibility to present on the Research Consortium program at an AAHPERD National Convention would not be restored until the 2010 National Convention scheduled in Indianapolis, Indiana.

If for any reason this research is not presented at the AAHPERD National Convention, you and all coauthors are prohibited from listing this research on curriculum vitae.

Thank you for your participation in the Research Consortium program at the AAHPERD National Convention. I look forward to seeing you in Salt Lake City.

Sincerely,

Patt Dodds, Ph.D.
Past President and Chair, Convention Program Committee AAHPERD Research Consortium
pdodds@educ.umass.edu

P.S. If you are not already a member of the Research Consortium, you may join, free of charge, when you become an AAHPERD member, simply by checking the box for "Research Consortium."

shelia.jackson@atu.edu Account Options... Languages...

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Message: 1 of 1 **Printable Version**

From: "Eldon Clary" **Save Address | Headers**
To: <shelia.jackson@atu.edu>
CC:
Date: Tue, 11 Oct 2005 15:16:31 -0500
Subject: **Human subject proposal**

Dr. Jackson:

Your proposal, "Effects of speed on overarm throwing: A dynamic systems perspective," has bee approved by expedited review.

Eldon Clary, Jr.
Dean of Graduate School
Arkansas Tech University
Tomlinson, Room 113D
Russellville, AR 72801

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